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MONTANA'S

SOLAR FINANCIAL WORKSHOP

Sponsored by:

Montana Energy Office
Montana Solar Planning Committee
Solar Planning Office - West

Held on: November 15, 1977
Location: State Capitol Building
Helena, Montana 59601

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EDITOR'S COMMENTS

This report contains the discussions that went on at the Solar Financial Workshop. The Montana Energy Office takes all claim for the editing as the actual minutes of the workshop were lengthy and at times the discussions were extremely wordy and pointless. For the most part, the words are still of the discussants and we feel that we were able to successfully preserve the contextual consistency.

EXECUTIVE SUMMARY

Montana's Solar Financial Workshop brought together fifty-seven people--including financiers, appraisers, real estate agents, state employees, representatives of citizen groups, and more -- to discuss the role of the financial community in solar energy development, particularly the identification of barriers presently discouraging financiers from making loans to builders who wish to utilize renewable energies, and then the search for procedures that would alleviate or eliminate these barriers.

Much information was shared in discussions and presentations and the following are some of the conclusions reached:

1. Our dwindling fossil fuel supply is causing more and more people to look toward solar energies as supplements and substitutes.

2. Solar systems exist and are in the process of development which can completently fill the energy gap that is opening as conventional fuels become more scarce and expensive.

3. The financial community must necessarily play a vital role if the use of renewable energy is to be encouraged.

4. Several Montana banks have already loaned money to solar home builders.

5. Financial institutions in some areas of the county have developed means of determining which solar systems they feel are reliable enough to be considered for a loan, and have instituted solar home loan programs.

6. Many Montana financiers and assessors have a definite interest in developing similar programs.

7. The solar loan programs discussed in this workshop stress the use of "approved solar systems" as necessary to the approval of a loan. Discussion with Montana's various builders and contractors leads us to believe that more flexibility should be involved in the loan-approval process. To allow for loans on self-built, well-made but not "officially approved" systems, it is suggested that the individual designer builder's experience, solar expertise and past record be considered in the loan decision. Of course, this would necessitate the production of some guidelines and the development of expertise on the part of someone in the lending institution, but it has become obvious that solar education is a modern necessity in all walks of life. Experts exist throughout Montana who could help financial institutions develop these guidelines. It is further suggested that Montanans designing and building their own systems be directed to local research and development organizations such as: Montana's Alternative Renewable Energy Source Program, Energy Solutions, Drapes Engineering Co., etc., for assessment of their systems (payment for services may be involved).

LIST OF PARTICIPANTS

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Mr. Bruce Wilcox	Partner - Berkeley Solar Group, Berkeley, CA
Mr. Peter Sardagna	Assistant Vice President San Diego Federal Savings and Loan, San Diego, CA
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Mr. Dana Gunderson	Engineer, Montana Renewable Alternative Energy Program, Department of Natural Resources and Conservation, Helena, MT
Mr. Michael Elder	Loan Officer, American Savings and Loan Association, Helena, MT
Mr. Jack Moore	Appraiser, Jack Moore and Assoc., Helena, MT

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I. Opening remarks by TED SCHWINDEN, Lieutenant Governor:

The role of my office in the energy field stems from a directive from the Governor. He challenged my office to develop a comprehensive energy plan for the state. This plan included drawing up a State Energy Conservation Plan (this was assisted by federal dollars); evaluating the energy distribution and flow in Montana and taking the necessary steps that might be needed to minimize impact of shortages of hydroelectric in the northwest due to drought conditions, and developing a state program to encourage the maximum use of alternative energy sources (which is the reason for this workshop).

It is unfortunate as indicated by recent polls that there is much public apathy and unawareness of the existing problem. Many working in the energy field could see the handwriting on the wall as petroleum and natural gas becomes increasingly expensive and scarce.

There are some problems that keep people from turning to alternative energies. One is the financial constraint, but I am amazed and pleased to see the excellent turnout for this workshop which shows your concerns. Another problem is that people feel what they have today works -- so why worry about the future? They dislike change. Also, people are reluctant to leap in -- they want to wait until others try it as they are concerned about the certainty of the technology.

The purpose of today's workshop is to look at the degree to which financial constraints might exist and ways they might be mitigated. Once, they felt that rubber tires on tractors would never make it; and they were slow to catch on -- but now you don't see any lugs. The inevitability of change is clearly going to happen, and I hope that these discussions with the experts will acknowledge the problems and formulate solutions that will make it easier for both the financial community and the individual.

II. Summary of Montana's solar planning effort by LARRY GESKE:

The Department of Energy (DOE) is currently sponsoring four regional solar planning efforts involving all the states in the country; Montana falls within the thirteen-state Western Region. Each state within the western planning group has received a grant to study and identify problems which hinder the development of solar energy within that state. Toward this effort, Montana has formed an in-state Solar Planning Committee consisting of individuals from both government and private sectors.

Each western state will form a suggested solar development plan, geared toward overcoming identified hinderances to its solar development, and submit this plan to the Regional Planning Office in Denver. The office will assimilate the better points of each state's suggested plan and develop a regional plan. The various regional plans may differ substantially because of differences in climate, geography, etc. DOE will review the regional plans and provide funding to implement them.

According to President Carter, we should have two and a half million solar units installed in buildings in this country by 1985; Montana's share of this would be about 8000 units. The Solar Energy Industries Association (SEIA) has projected eleven million solar units in the country by 1985; that would mean approximately thirty-five thousand for Montana. What the actual figures are by 1985 depends on us and how well we set goals, carry out those goals, and keep everybody informed. I was surprised to see the results of the survey we sent to all lending institutions in the state which showed that about twenty-five percent of the lending institutions have already made solar loans.

III. Solar Equipment Technology, re: Financing Installation by BRUCE WILCOX with LARRY GESKE, Moderator:

Our first speaker is Bruce Wilcox of the Berkeley Solar Group. The Berkeley Solar Group offers consulting services relating to energy management and solar energy utilization in residential, commercial and industrial settings. They have extensive experience in solar applications, energy use, thermal analysis, computer science, mechanical engineering, economic analysis, architectural design and education. Bruce is a partner of the Berkeley Solar Group. One of the main reasons I sought Bruce as a speaker was that his company has evaluated over 70 commercial solar water systems and pool heating systems in support of the Bank of America's Solar Home Program and they also plan to review solar heating systems under consideration for financing by the Bank of America. Bruce has a degree in architecture from the University of California, Berkeley, has three years of professional experience in architectural design and has taught solar energy system applications, equipment design and energy conservation for buildings and graduate architectural classes at the University of California. With his partner he is developing a computer technique for modeling the thermal performance of active solar heating systems and he directs all aspects of the group's work. He is responsible for a computerized building energy use study that the Berkeley Solar Group has performed. He is also involved in solar system design, equipment evaluation research and is a member of the International Solar Energy Society and is the Vice President of the Northern California Energy Association. I would like now to present to you Bruce Wilcox.

BRUCE WILCOX:

As Larry said, the main reason for my being invited here has to do with the work I have been doing for the Bank of America. I don't represent the Bank, but belong to a private consulting firm which has done a considerable amount of work in the last six months in developing a solar loan program, the first component of which is a retail dealer loan program for retrofitting solar systems such as domestic hot water and pool heating systems, mainly into existing buildings. This program operates for both a dealer generated loan and as a standard for home improvement loans for individual customers. The Bank is also beginning to develop a standardized program for doing mortgage financing on new construction; and, we have been assisting the appraisal department in evaluating this project. We have inspected the products of about forty manufacturers in California. We have looked at their equipment and applied a set of standards that we devised in cooperation with the Bank to decide whether or not the Bank should finance this particular equipment and to determine if it would meet the needs of the Bank in terms of their financing program. The basic fundamental approach has been to avoid problems that are predictable -- in other words to be conservative.

My ideas of what the Bank of America has been concerned with and which you should probably be concerned with in financing solar equipment are: 1) If things happen the way they are projected, there is going to be a substantial amount of business for banks. Solar equipment is very capital intensive and must be financed by somebody. There is a future business development aspect to getting into solar now. 2) Secondly, a solar program right now for a bank is one way of showing that the bank is progressive and that they are concerned with today's energy problems and are doing their part to meet the nation's needs, etc. In other words, it is good public relations. I think the above are two main reasons that bankers want to get into solar at this time.

Why do they get involved with a program like ours? First, when they do make loans on solar equipment they would like to be able to collect when it comes time to get repaid, and there is a basic fundamental reality at banks: it becomes rather difficult to collect on loans if equipment is no longer operating. The fundamental thing is to try and avoid the kind of problems that would encourage the customer to think that he was justified in not paying back the loan.

In California there is a law called the "Over Due Course Act." The significance of this act is that if a bank essentially cooperates with the dealer in generating loans, and if the bank buys the contracts from the dealer, then the bank is ultimately responsible for the performance of the system. If the purchaser can't get satisfaction from whoever sold him the equipment he can then go after whoever owns the contract. So essentially on this kind of dealer generated business the bank is going into partnership with the dealers. Consequently, there is a real strong motivation for making sure that whatever equipment goes on the market and is installed is going to give as few problems as possible.

Finally, the bank in promoting a solar loan program is encouraging its customers to buy solar equipment and, of course, would like to be reassured that it is not encouraging people to do unwise things that are going to cause them problems because ultimately, this would reflect on the bank.

I have taught engineering classes for the last couple of years at the University of California and tend to take a professional engineering approach to solar energy. One of the fundamental rules is to avoid failures in whatever kind of systems you design and install. We must know what the problems are likely to be and freely discuss them. When I discuss potential problems of solar energy systems, it doesn't mean that I don't think that solar energy systems are a good idea or that they won't ultimately be successful or that there aren't good ones around now. But I think it is essential for the development of the solar industry that people not push problems under the rug. I think that it is really critical at this point in the development of the solar industry that we be very realistic about the future potential of solar heating and domestic water systems, and that the problems that exist are brought out into the open so that people don't make the same mistake over again. But when you sell systems on a retail basis to customers who are concerned about supplying heat, the burden is on the industry and all the people involved to insure that what is installed has a very good probability of working.

From a bank's point of view, the problem of looking at solar systems is one of finding the value of the system. The three primary considerations are aesthetics, performance and longevity.

Aesthetics is an interesting issue. Many solar houses are not conventional looking. For instance, in California they don't look like a Spanish type house with a tile roof, which can be a problem for some people. But it doesn't mean they are ugly. I have a basic feeling that aesthetics of architecture follows function -- so after a period of time something like a carplace or front porch which started out as something to protect you from the rain or to keep you warm eventually becomes integrated into the whole style and becomes something that is desirable. I think solar collectors will in time end up that way.

There are several issues in the area of performance. First, does the solar system deliver the energy savings that the buyer expects? In other words has he been sold a bill of goods or is there realistic appraisal? I don't think there is any magic amount of energy savings that a solar system should deliver -- depends on the cost, the circumstances, the climate and a lot of other things. But I do think it is critical that everybody expect the same thing and that it deliver what is expected. To give you a rule of thumb, with a space heating system we usually look at something between 1/2 and 2/3 of the energy delivered per square foot per year in a space heating system. Domestic solar water heaters should deliver somewhere between 2/3 and 3/4 depending on the application. The second issue is,does it deliver all the heating and hot water that the customer can expect under normal conditions? When he turns on the faucet on a cloudy day in December is he still going to get hot water? It is essentially an issue of what kind of back-up systems are installed to work when the solar system is not working due to bad weather or for whatever reason.

Most people buying a new house and installing solar equipment in their house will expect ultimately to get about the same kind of performance they get out of a normal hot water heater. Even if the solar system works fine, they will be unhappy when their system doesn't work during cloudy weather in December.

Third, the system must have low maintenance and operating costs. Any kind of a system you put in that is really going to do the job is going to have to be almost maintenance free under normal conditions. Also you need to check whether your equipment is going to require you to be an expert mechanical engineer to operate it. I don't think that is acceptable for most retail and widespread use.

Another related issue is, must there be someone there at all times to take care of emergencies that the system is not designed to take care of? A classic example of this (and probably wouldn't happen in Montana) is found in California where people have been tempted to buy systems that don't have any freeze protection because it hardly ever freezes in California. This means that whenever it is cold you have to be there to drain the system or cover it up with a blanket or else it will freeze. And inevitably the system always ends up freezing while you are away at a New Year's Eve party and forgot to go home and drain the collector or something. I think it is really critical that the system not require fantastic amounts of maintenance or protection.

Another issue is that the system must be absolutely simple. Otherwise there is little chance that it is going to last without failing. Some heating systems are designed to have as many as thirty motorized valves and when you have thirty motorized valves the probability that one of them is not going to work is probably more than 100%. This is the kind of solar system you don't want to install. This is a real strong argument for passive systems which are indestructible, intrastructure type systems that lets the sunshine into the building and so on.

Performance -- the only way you can avoid this problem is to require some kind of standardized procedure for calculating performance. Probably one of the simplest and most straightforward is contained in the "HUD Intermediate Minimum Property Standards in Solar Heating and Domestic Hot Water Systems" which just came out.

In determining expected performance one must accurately estimate the heating demand. You can overstate the output of your solar system and lead people to believe it is going to do more than it will (90% rather than 60%). On the other hand, if you lead people to believe they don't need much energy by manipulating engineering calculations to prove that a small solar system is going to work, then the end result is the same.

Another issue is just bad design. One of the classic examples of the past is that solar designers concentrated on the solar collectors and ignored the more conventional parts of the system to cut the costs. You end up with a system that doesn't perform well even though the solar collector is good.

Three basic criteria should be considered with respect to equipment life. One, will it last as long as the period of the loan. This may be one of the more significant ones from the lender's point of view. If the installation is on an existing home and a home improvement loan is used to finance the installation (this type of loan is usually limited to five years or less), the equipment life should last longer than the loan life. I am not sure how to deal with mortgage loans. I don't think most mechanical systems are designed for thirty year life--even air conditioning systems are usually considered to last about fifteen years.

Second, will the equipment last as long as the warranty period -- especially since the bank is somewhat responsible. HUD seems to be pushing for a five year warranty on all systems that are going to be installed on their demonstration program. Of course, you realize the warranty is only as good as the company that stands behind it. The bank feels it is better to have a shorter warranty because that limits their liability. From the consumers' point of view, will it last long enough to pay back the cost of the system in energy saved?

The State of California pays 55% of the cost of the system up to $3000 as a credit on your state income tax. This tax incentive really makes investing in a new solar house desirable since you buy a house on a thirty year mortgage and get half the cost of the solar system back in the first year. That is an excellent return on your investment.

Some of the general problems with solar equipment are: degradation, materials wear out -- plastics turn yellow from the sun, paints on collectors start turning gray because of degradation, scale builds up on the inside of the system, i.e. pipes, and sealants wear out. A house built in 1959 in Denver by Dr. George Lof (a pioneer in the solar business) was very well instrumented when built, and was studied for years. After fifteen years ERDA conducted a study to determine how efficiently it was now operating compared to how it originally operated. After fifteen years, the system had degraded about 30%. So you can expect material degrading -- the question is how much. Of course, there are also outright failures. Major categories of failure are things like collector freezes and breaks, corrosion and stagnation. Stagnation occurs whenever the system isn't operating, when the sun is out and the system cannot take the heat out of the collector fast enough. The panels then heat up until they reach the point where the heat drawn from the collector equals the heat absorbed; and with a well-designed collector -- the more efficient your collector the more stagnation problem you have. All of the materials in the system have to be able to take this extreme temperature.

How do you avoid these kinds of problems? I think the first thing to do is to deal only with reputable, experienced, appropriately licensed people who have experience in what they are doing and have a stake in maintaining their own reputation and investment.

Secondly, you make sure that the buyer knows what to expect, including performance and how long it is going to last and particularly that people understand what they have to do to make sure that the system lasts. If the antifreeze has to be changed every two years, then there ought to be an instruction book that says change antifreeze every two years -- if you don't it will fall apart. Instructions on how to operate the system must be included.

When you can, finance solar systems that have been tested, certified, optimized and so on. The most common testing procedures are called the ASHRAE 93-77 or the OMBS. Basically, this test checks the instantaneous efficiency of the collector. What you really want to know is how the whole system is going to operate. But testing the whole system is more complicated than testing collectors. The people who have paid to have the tests done by the independent testing labs are probably the ones that are serious in the business. California has a program that will be in operation next spring that will certify collectors.

In summary, I think it is really important that bankers get involved in financing solar equipment because it is necessary for the growth of the industry and necessary for solving some of our energy needs in this country through solar energy. I think it is very important that people in the industry in general as well as bankers take all care possible to avoid widespread failures and shortcomings. I think the answer is to do it but be careful and intelligent about how you do it.

IV. A Banker's Approach to Solar Lending by Peter Sardagna:

LARRY GESKE, Moderator: Peter Sardagna is from the Newport Beach Office of San Diego Federal Savings and Loan and is head of their commercial loan department and also handles their solar and energy loans. He has been involved in solar for over five years, first in his own private business and then with San Diego Federal. He has designed solar systems and was responsible for the first solar subdivision on the outskirts of San Diego which contained some twelve homes.

PETER SARDAGNA

We lenders have to protect ourselves and the borrower. The twelve homes that Larry alluded to was a guinea pig subdivision and we encountered problems. I might mention that the solar systems installed were installed at no cost to the buyer and they knew they were going to be experimental. In those days there were no solar experts, so the only way to learn was by trial and error and to use a lot of common sense and engineering know how. At San Diego Federal we have approached the problem of lending and have in fact come out with the first program of its kind in the United States. We will finance retrofit and new construction utilizing solar equipment over a period of years. To date we have made somewhere between fifty and sixty such loans.

The single biggest problem that I encountered when I entered the solar business was the $2000 price tag for a hot water heater. It was hard to sell Mrs. Jones on $2000 for a hot water heater. It's not like a color TV which is much easier to sell. The only basis on which the equipment can be marketed is hopefully Mr. and Mrs. Jones will listen to someone's promise of saving dollars. Each month they write a check to their friendly utility company and each month this bill increases. So there is some rationale in paying the cost for a hot water heater or a space heater system because you can save on those monthly bills. Hopefully that would be enough incentive for them to invest. But if the investment has to be made in one lump sum, then you wind up with only affluent people doing it. Affluent people's motivation hasn't been so much economic as being the first one on the block to have a solar collector. The fact that natural gas costs them sixteen cents a therm and it only shows one and a half percent return on the investment is beside the point. They want a collector on their roof so everyone can see they are doing their part for their country and saving energy. Although it might sound good, I really don't believe that is a realistic motivation to get the general population to invest in solar equipment.

Somehow the bottom line always reads economic. Solar technology has to make economic sense -- as it now does, even when you know what the problems are and the limitations of the systems. We as lenders address ourselves to those systems. From a hard investor's standpoint the system has to make sense now. Systems that we finance do. In the southern California area with utility rates as they are, domestic hot water systems will show a ten percent or more return on investment -- net of maintenance costs -- where the electric rates are running around four to five cents per kilowatt hour. They will not show that return when the system is competing against natural gas. The largest and most widely used equipment in southern California is for solar pool heating. The reason for this is that you don't need sophisticated, high-temperature, glazed collectors. Less expensive collectors can be used which produce inexpensive heat and thus can compete against natural gas. For space heating in California our experience has been that a solar system will show ten percent or more return on investment in high cost areas like fringe areas where the electric rates are rather high.

The principal criterion for financing a solar system is that it makes economic sense; it will show a ten percent return on investment. We also know that the value of the energy generated by this system will increase as the conventional energy costs increase. We share the concerns for aesthetics as we approach the problem of appraisal. In financing the systems over thirty years, the question that we have asked ourselves is on what basis can we increase the appraised value of the solar home -- let's say we are comparing a $50,000 solar home and a comparable home of about the same value. House B doesn't have a solar system, but Mr. Jones in House A puts one in. It's a domestic hot water system that costs $2000 and he is saving $200 to $250 a year. What does this do to our appraiser and how is he going to evaluate it? We discussed this problem for months and the hard conservative view of the appraiser was:

I can't point to homes that have historically sold for more because they have a solar system. There is no track record for appraisers to say "in fact this house is worth more." So then we looked at it form the economic point of view we mentioned earler. The added criterion now is the cost of utilities on the home, and that a home has a lower operating cost. The conclusion we came to is that House A with solar will be easier to sell to the extent that more people can qualify for financing. Now this is just an indirect conclusion. We do not have a track record to say that is the way it is. We also think that it makes sense that the home would be easier to sell because the cost of the energy generated by the system will remain constant. We definitely feel that the home is more marketable and more valuable. We decided we would increase the appraised value of the home by the cost of the system provided such increases would not be more than ten percent of the value of the home -- on a $50,000 home we would increase the appraised value by $5000, provided that the $5000 additional costs is used for installation of a solar heating system, and that this system shows at least a ten percent return on the $5000 invested. We have been pioneers here and hopefully history will catch up and prove that we were right.

Our doors have not been beaten down by people clamoring to get loans. This is something that initially baffled me, especially in view of the attractiveness of the loans. As an example at 9 and 9 1/4% interest on a water heating system, the monthly payments on the system are actually less than the cost of the energy today. So what argument can the consumer have for not putting a solar system in? There is no argument on an economic basis, provided it is a well-designed system. There is no valid argument especially with the 55% tax credit (for California). The return of investment capital is almost infinite to you under this latter condition. So what is stopping people from putting in systems? The biggest obstacle, I think, is simply that the people do not know that this is available. They do not know that systems are there to do the work now. Everyone still claims that solar is in the embryonic stage -- still in the laboratories. I think this is the biggest single fear the industry has to overcome. The hurdle of financing and economics has been overcome to a great degree in California.

As time goes on and utility rates go up as we all expect them to go, more areas will be able to show a fair return on investment.

In getting our loan program off the ground we had to ask ourselves, "What solar equipment are we going to finance?" We searched for some kind of standards but there wasn't any. California is just now coming out with a standardization program and we are working closely with the energy agency. Being a pioneer, we had to develop our own criteria or guidelines which are very general in nature. The intent is to protect ourselves and the consumer against system failure. The first thing we look for in any manufacturer is a copy of independent test results. We don't want the manufacturer's or the consumer's opinion about what a system will do. We want results of a thirty day stagnation test and more than a five percent reduction in efficiency will not be acceptable. It's a little more stringent than HUD requirements. What does the testing results tell you? Well, you get back a sheet full of fancy formulas and you have to be an engineer to interpret it. But you can compare collectors on an apples for apples basis. That tells you whether it is a good collector as far as efficiency is concerned, the type of material that it is made of, etc. Here, you can use a lot of common sense.

We also insure that the solar installers are qualified. We require that they have experience installing at least ten systems which we can go out and inspect and interview the owners. This tells us that the installers are experienced and have a good track record. Also, we check on the contractor financially if we have a dealer arrangement with them.

We check out manufacturers financially to ascertain if they are strong enough to stand behind their warranties. We do not feel that warranties in excess of five years are realistic at this point yet. On the other hand we do expect five years to be a reasonable time in which the contractor or manufacturer should come back and correct any problems. We are quite sensitive to our liability to the borrower. We don't want to end up holding a bag with a bunch of pipes and boxes of equipment that don't work.

Our approval or disapproval of an individual system depends basically on the standard design. Modifications can be made from home to home: the distance from storage tanks to the collectors is a consideration. We also look for the basic standard design that the installer will follow in all the installations with only minor deviations.

Standard plans are prepared by a qualified professional engineer. All of the contractors and installers are licensed for the work. We also require that they take out a building permit.

We think that it is very important that solar be architecturally tied into the surrounding area like any custom built home. It should blend well in the area. It can't be an oddball on the street. There are very clever ways to do it -- by using parapets and other screening devices. Collectors have been cleverly built into roofs to look like skylights. Sometimes it takes considerable expense, and that should be cranked into the economics.

We encourage all of our tract developers to install the basic plumbing and wiring in the homes and offer solar as an option. We are sold on it and convinced that in the next five years it is going to become very successful and a major industry. Our company has joint ventures with residential developments and in all of these we are putting in the basic pipes and wiring. In fact the homes are designed so that the roofs are oriented correctly and collectors can easily be added.

How deep a lender should go into the technical aspects of a system, I am not quite sure. We welcome the certification program that is coming in California. Hopefully, that will include not only the collectors but the entire systems as well. We are very adamant about the certification program for the industry -- engineers and architects. Special courses are needed to qualify them for solar engineering. Conventional engineering practice doesn't qualify an engineer to jump into solar system design. We are waiting for the day when we can rely on someone else to make us feel comfortable about solar equipment. We will, of course, look at the list of manufacturers and installers as we do for conventional construction.

In conclusion, the program that we have come up with is thirty year financing for new construction. We simply include the cost of the solar heating system right along with the brick and mortar, and then we go eighty percent of the appraised value. As long as we have the first mortgage we will also finance and retrofit over thirty years. We also have a program for any amount over $2500, where we will finance over fifteen years -- amortization at one percent below the current home improvement loan rate. That is 9 3/4% on solar heating systems.

V. A Private Montana Citizen's Problems in Financing an Energy Efficient Home by Terry Savage.

TERRY SAVAGE

What I have been trying to do in Superior, Montana, is install a hydroelectric plant with a subterranean house. I have been trying to do this for about a year and a half and the financing is impossible. In Missoula I have approached almost all the financial institutions and found them totally unreceptive.

I own a piece of property near Superior, Montana, consisting of a hundred acres. On that property I have an existing dam site and an existing irrigation system consisting of about 1000 feet of 20 inch steel pipe and about 900 feet of 13 inch steel pipe with a 13 inch shut off valve. I have hired Mr. Delp of Independent Power Developers from Noxon, Montana, to engineer the site for two possible hydroelectric systems -- either a 12 kilowatt system or a 24 kilowatt system. Mr. Delp can answer any questions on the feasibility of the systems.

I am presently two miles from Montana Power, the only public power source, and they want $14,000 to run in power lines. Mr. Delp can put in a hydroelectric system using the 12 kilowatt system for about $13,000. The economics of the hydroelectric system are favorable. When you consider the long term there is no question about which system I would prefer. The large hydroelectric system would be more than enough to run my house, a shop building, garage, greenhouse, and possibly even to produce hydrogen.

I designed a subterranean house. The reason I chose a subterranean design is because it is the most energy efficient structure that can be built. The stable moderate temperature of the ground saves enormously on the heating and cooling costs. In fact the earth surrounding the house reaches its highest temperature about the time one begins to need heat, and it drops to its lowest temperature about the time one starts to need cooling. The mass of the concrete in the house has a great deal of value as a moderator of the house temperature. The concrete heats up and cools down slowly, and once this mass is heated to a desired temperature it remains there. With a subterranean house there is very little wind chill factor to pull heat out of the house. The cost is approximately $24 a square foot. Exterior maintenance is just about eliminated and thus increases long term cost efficiency. It is likely to be more fire proof than a conventional house, and storms leave it undisturbed. A subterranean house will be in good condition at the end of the mortgage period. In fact, one hundred years hence it should still be in use. With a subterranean design there will be very little air infiltration and thus it should be fairly easy to keep clean.

In trying to finance this project I first approached the Federal Land Bank. I went because I am in their major lending area -- the rural area, and felt there was a lot of sites in rural Western Montana that are adaptable to hydroelectric.

After my disappointing try with the Federal Land Bank I went to other banks in the area. They all just said no. Now in all honesty the first reason they said no to me was because I was outside their lending area, I was out in the country. But I asked them if I were to build it in their lending area would they finance it. Again the answer was a flat "no." The reason given by the banks was that they would have to use their own money to finance and they would not be able to market the mortgage. They called it a high risk venture. That was typical of all the banks' responses. I also tried the Savings and Loan institutions. Their response was that they would be reluctant -- meaning no -- to finance it. Knowing no other private sources in the lending area to try, I came to the conclusion that I am not going to finance it unless I get money from some kind of governmental program. To this end I called more people than I could even remember; for example, I called the Governor's Office, the Montana Department of Housing, the Montana Department of Natural Resources. I must say they were all sympathetic but didn't have any money for my type of problem and could do very little. I then turned to HUD in Helena and I met with them to review the plans. Subsequent to this meeting, I got a letter back from HUD with a list of ten items that I would have to include with the plan before it was approved. They also made it known to me that from that point on I could not deal directly with them but must work with a financial institution. The second letter from HUD really upset me: They said "Public power is required, an individual power plant is not eligible for FHA mortgage insurance." At that point I made phone calls to FHA in Washington, D.C. I asked them why public power was required. They were very nice and said they would check it out and get back to me. They called and stated that they found no place where public power is necessarily required. All that is required is a reliable system and they doubt whether a hydroelectric system is reliable. I don't know if they have told that to the Corps of Engineers yet.

EDITOR'S COMMENTS:

The above portion of Terry Savage's testimony vividly portrays the frustration and disappointment of an individual interested in financing a superbly designed, energy efficient home with a reliable alternative renewable energy system. The lending institutions must begin to examine clearly their lending policies and make an honest effort to challenge some of the old traditional banking philosophies; obsolescent practices in an era of an energy crisis can ultimately harm everyone.

VI. How a Solar System Works by Kye Cochran and Dana Gunderson

I (Mr. Gunderson) work for the Department of Natural Resources which manages the Montana Renewable Demonstration Program. That program was established to provide grants to people so they could build solar homes to show they do work and to get some idea of costs involved and the efficiencies.

Basically there are two kinds of solar collectors, liquid and air systems. Probably the best way to view a collector is just like a car that is parked with the windows rolled up and imagine that it is 90 degrees outside. It would be much warmer inside the car than the 90 degrees outside. A solar collector works exactly on the same principle. Sunlight penetrates through glass and is reflected back at lower wave lengths which the glass won't allow to pass. So you get heat built up inside your car and the same applies to the inside of the solar collector.

Liquid collectors generally are more expensive than air collectors, although there are numerous tradeoffs. With the water system there are corrosive problems as well as freezing, but liquid collectors have higher efficiencies than air collectors. You could have dust in air systems that will be deposited on the black absorber plates making them gray instead of black with loss of efficiency. Air systems do not freeze but have to move a lot of air to transfer the same amount of heat compared to a water system, meaning large areas set aside for ducting. Water per unit volume can absorb more heat than air.

Your total heat load which can be supplied by a solar heating system can be 40-60 percent in Montana. These figures vary according to the house, life style of the people, insulation factors, the solar system used, etc.

I (Kye Cochran) would like to stress that a solar system will not work in any building unless the building is well insulated. Also, a passively designed building (allowing the sun to naturally heat the interior of a building through large south-exposed windows) will greatly reduce the required heat level.

The diagrams on pages 25-32 portray the basic active and passive solar concepts.

VII. Problems Associated with Solar and Conservation Investment Appraising in Residential and Commercial Buildings by Jack Moore:

JACK MOORE:

The appraiser looks at solar property no differently than he does other property for which he has been asked to determine the value. An appraiser is going to analyze the basic appraisal problem, defining what the problem is and going out to the site to see that it is the best use of the land.

Solar homes do not have to look like a chickencoop. If you get a chance when you are going through Boulder, Montana, look at Dr. Pallister's new home which is about a mile south of Boulder. The design of that home might not appeal to you; but does every home design appeal to you? This home is quite conventional with the solar collectors in the gables. But the aesthetic from the appraiser's standpoint is there. A solar home doesn't have to be something way out; it can be tastefully done. The appraiser has to consider the design and this must be part of his thinking.

The cost approach in residential or commercial building is one basis which the appraiser would use. The income approach to commercial property with solar installation is going to show a savings in utility charges which will affect the appraisal.

A more favorable interest rate is going to affect the appraisal as well as tax breaks. If the taxes, utility costs, and interest rates are low it is going to give you much greater net income assuming that the property is rented at a fair economic rent. This will make a considerable difference when it is capitalized out. The more favorable the interest rate, the higher value can be reflected to the property. So the appraiser had better be aware of the tax incentives and the rest of the considerations I have mentioned.

The design of the whole house is what counts. It all has to integrate together. In our office we have had a total of fifteen appraisals made on solar projects. Three years ago we had none. Two years ago we did five -- this year we have done ten of them. The total number of appraisals as compared to the total volume in our office is less than one-half of one percent. I have asked myself several times if the volume is so low why in the world am I spending my time running around to Spokane looking at solar? To Great Falls looking at solar? Why get involved in solar? It is because I feel that the appraiser who is not doing this and is not trying to keep up with the times, will find himself in the Model T era. Surveys, predictions, etc., that we read tell us we are looking at a whole new method of heating a home. It is the biggest transition in the building industry that has come about for a long time. The change from plaster walls to sheetrock walls, the change from one pipe to two pipe hot water systems, or the old coal-wood burning space heater to a central system, the change from the one steam valve to automatic pnuematic controls, individual room controls -- all came about in gradual stages. Solar is coming much faster. It is going to make a turn around in the next five or ten years. We are moving into an era that is rapidly changing -- the technology is changing all the time and that is where we are having some problems in the appraisal field -- trying to keep up with the technology. HUD has recently published intermediate minimum property standards for solar that will help. This is probably the best thing that has happened. We no longer have to make appraisals following the rationalization process.

An appraiser is trying to make a living as an appraiser. He doesn't have time to just go out and spend time searching. We need some summaries of what is pertinent for the appraiser, what is pertinent for the lender, and get it out to use. I would like to see seminars -- one day -- half day -- or whatever for appraisers to educate them in solar and what we are to expect.

Question: Of the ten systems you appraised were they hot water or air?

Eight of them were water systems and two were air. The air systems were in conjunction with a heat pump. One of the homes was designed by a solar engineer -- Jim Taylor on the northside of the Helena valley, which is an ideal location for solar. Then there is the Serendipity Apartments -- 42 units -- which is located in downtown Helena with solar collectors on the roof.

VIII. Solar Installation Lending Concerns in Montana by Mike Elder:

There was a form sent out -- a survey -- to the lenders in the state asking them several questions as to whether or not they had made loans for solar homes. Thus far 23 known loans have been made in the state. Some of the information asked was: Should the different agencies (SBA, FHA) get involved in guaranteeing or funding loans, would the lenders be interested in supporting the loans and participating in the programs. Between 83 and 90% of the respondees did give an affirmative response to involvement by these agencies. However, one agency that was overlooked is the PMI Company. This is the company we will go to when an individual comes in and says to us "I have only 10% to place down on my total costs." when generally federal regulations require most lenders to have at least 20% in order to have adequate coverage on our exposure in return for the investment. If anything goes wrong, we at least would have leeway where we can sell it and not lose our shirts.

Mortgage Guarantee Insurance corporations are now very much into solar and other forms of renewable energy as far as backing them. If you would have a 60% loan to value ratio or cost ratio you could insure it with them.

A big concern of lenders is to be aware of the cost of solar to people and try to help them to get into solar. Peter Sardagna of San Diego said that he felt it was necessary for a lender, if they were going to be interested at all in making solar loans, to be an active and not a passive lender. If you are going to get into it you need to designate at least one person to get in and identify who the contractors are, who are the manufacturers, whether or not they are effective, what procedures and criteria you need to make these loans and keeping yourselves abreast of changes in the industry. The informational system is going to have to be improved upon in order for all of us to adequately determine if a solar unit is good and whether a back-up system is installed. Also performance data is lacking on many of the systems.

What dollar values do you hang on a $5000 initial cost for a solar system when the next guy comes in and sees the solar collector up there and is not interested in an energy efficient home, when he feels solar detracts from the aesthetics. But this does not necessarily need to be the case in a well-designed system. Life cycle costs is something that we at American Federal have not yet considered, but now since energy efficiency or the ability to keep fuel costs down has become more pronounced, we must began to take this into consideration. Recently, because of a state program in FHA-VA type loans I found it was necessary to take into consideration the cost of utilities, the cost of maintenance and I begin to realize why it is a very important factor. I think that the majority of lenders in Montana are interested in obtaining information on materials and contractors and if possible it might be effective for the state to disseminate this information; or we (lenders) may decide it is more feasible for us to do it on our own.

Minimum building codes need to be established by someone. Peter mentioned earlier that he has a minimum requirement of 10% return before he can make a loan. We need to establish similar criteria.

We (American Federal Savings and Loan) have made two loans, both of them on new construction, and one is about 50% complete. Therefore, we don't have the operational information. This is where most of us are at in Montana banking especially in the area of new construction.

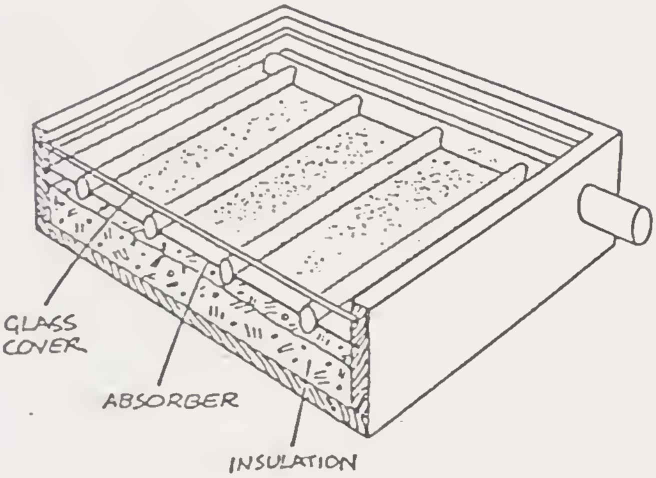
SOLAR SYSTEMS

There are two basic types of solar systems:

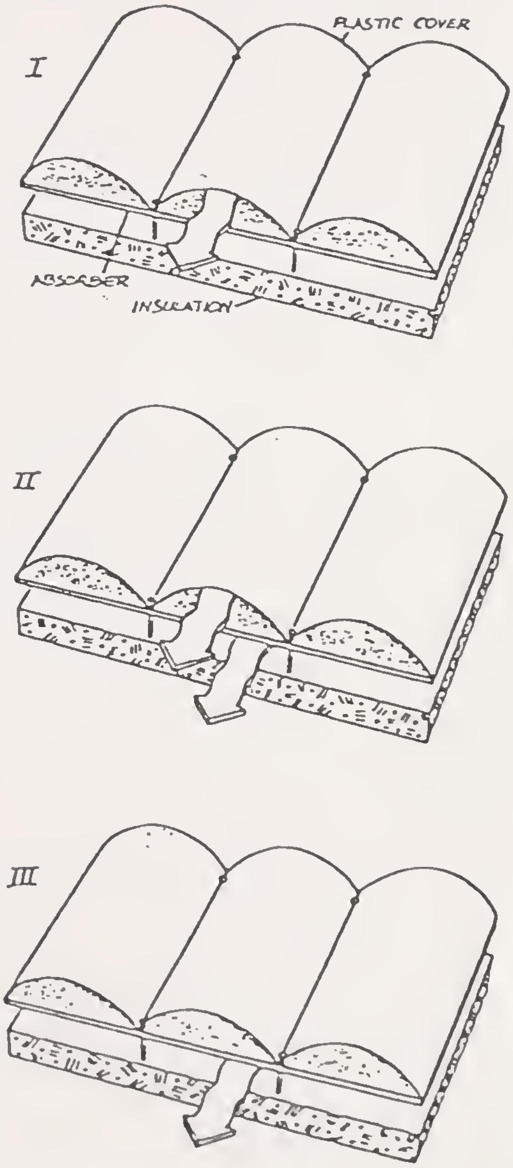
Active or indirect systems collect heat by means of solar collectors, and transfer the heat by means of pumps, ducts, pipes, etc. to a storage medium. When heat (or hot water) is needed, it is brought from storage to the point of need.

Passive or direct solar systems collect and store sunlight without the use of hardware such as collectors, pumps, and motors. Following are some examples of the two types of systems.

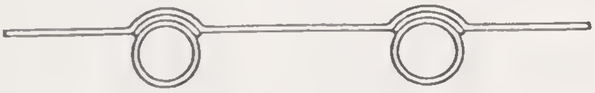
ACTIVE
or
INDIRECT



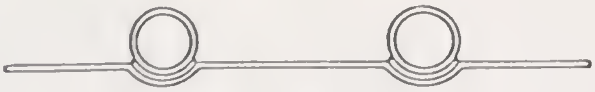
A liquid-type flat-plate collector.



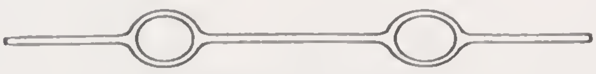
The three types of warm air solar collectors.



TUBES BELOW PLATE



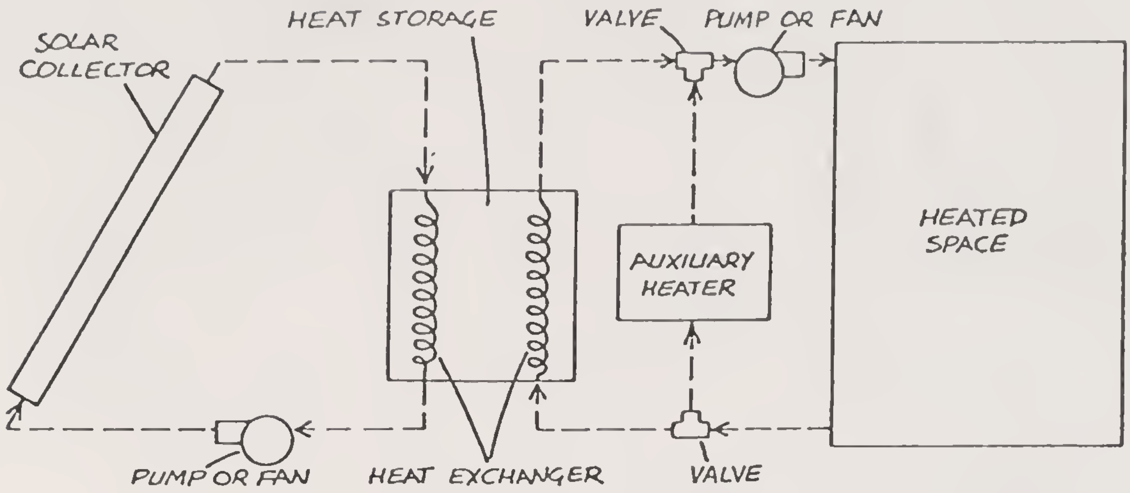
TUBES ABOVE PLATE



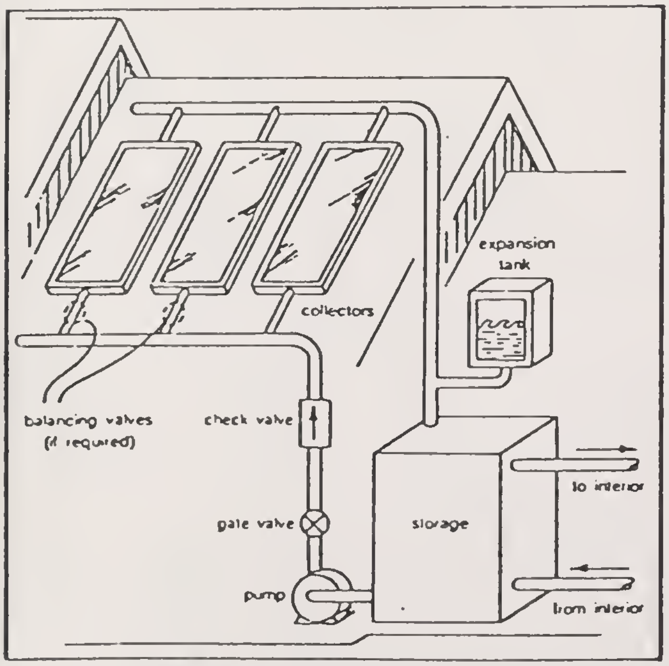
TUBES IN PLATE

Tube-type absorbers—three possibilities.

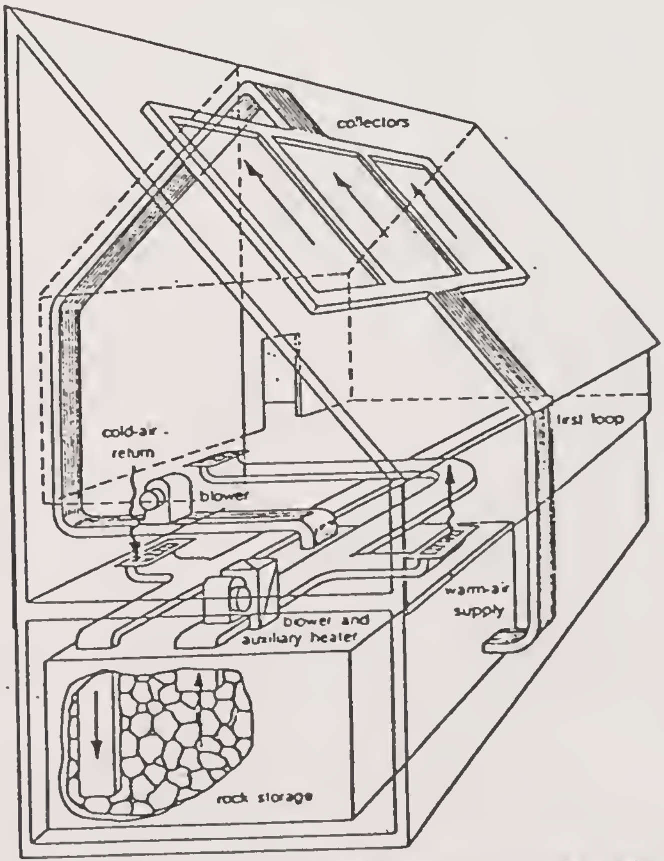
ACTIVE SYSTEMS (cont)



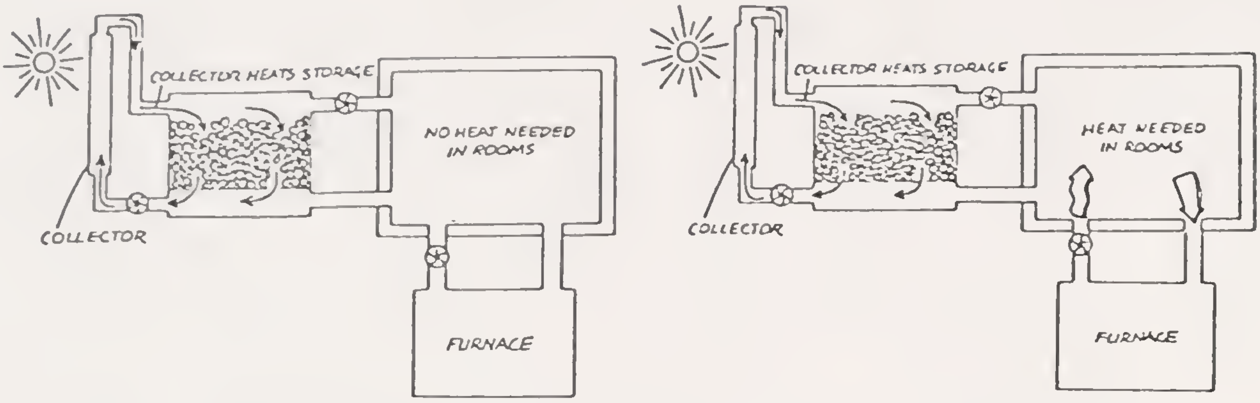
Basic components of an indirect solar heating system. There are two primary heat transport loops—from collector to storage and from storage to the rooms.



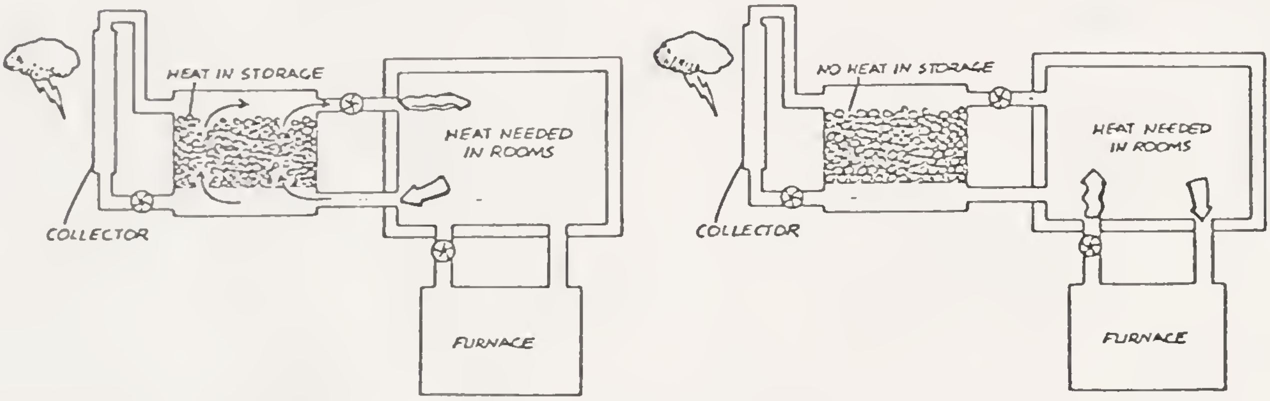
Details of a first-loop circulation system using water.



A schematic for a solar heating system utilizing air.



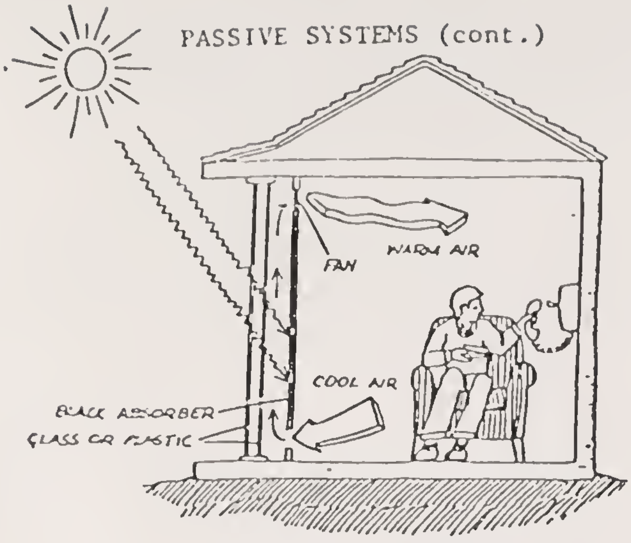
When the sun shines, the collector heats the storage. The furnace heats the rooms when necessary.



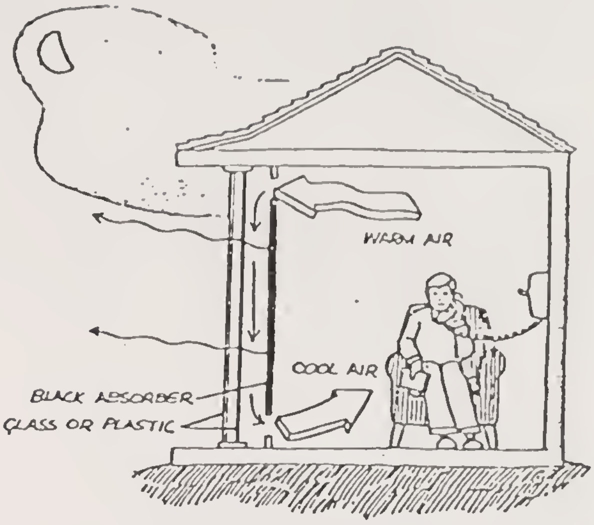
When the sun isn't shining, stored heat is delivered to the rooms as needed. If there is no heat in storage, the furnace comes on.

COMPONENT OPTIONS FOR INDIRECT HEATING SYSTEMS		
Collector Fluid	Heat Storage	Heat Distribution
air	rocks or gravel small containers of water small containers of phase-changing salts	gravity convection forced convection air-fed radiant panels or concrete slabs
water water-antifreeze solutions oil and other liquids	large tanks of water or other liquids large tanks of water embedded in rocks or gravel	baseboard radiators or fan-coil units water-fed radiant panels or concrete slabs forced convection past water-to-air heat exchangers

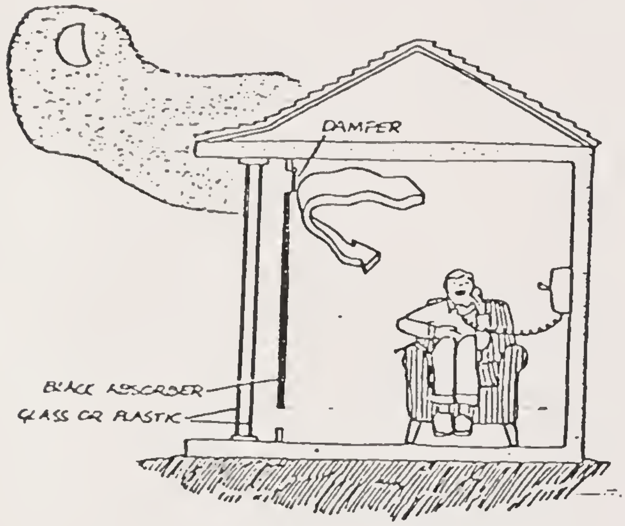
PASSIVE SYSTEMS (cont.)



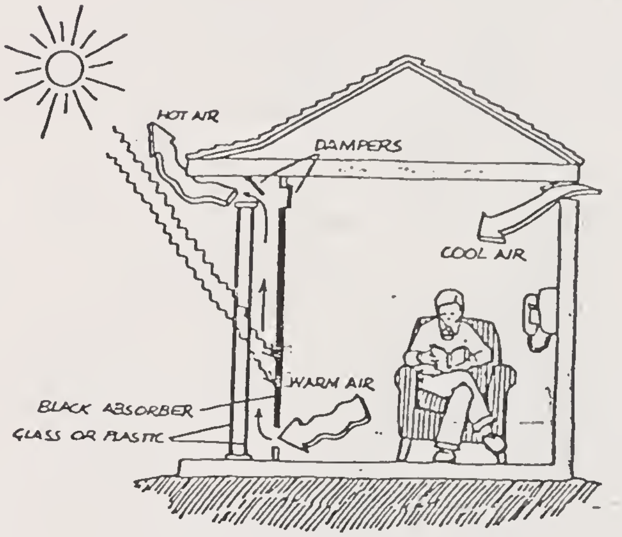
Added fan provides heat control.



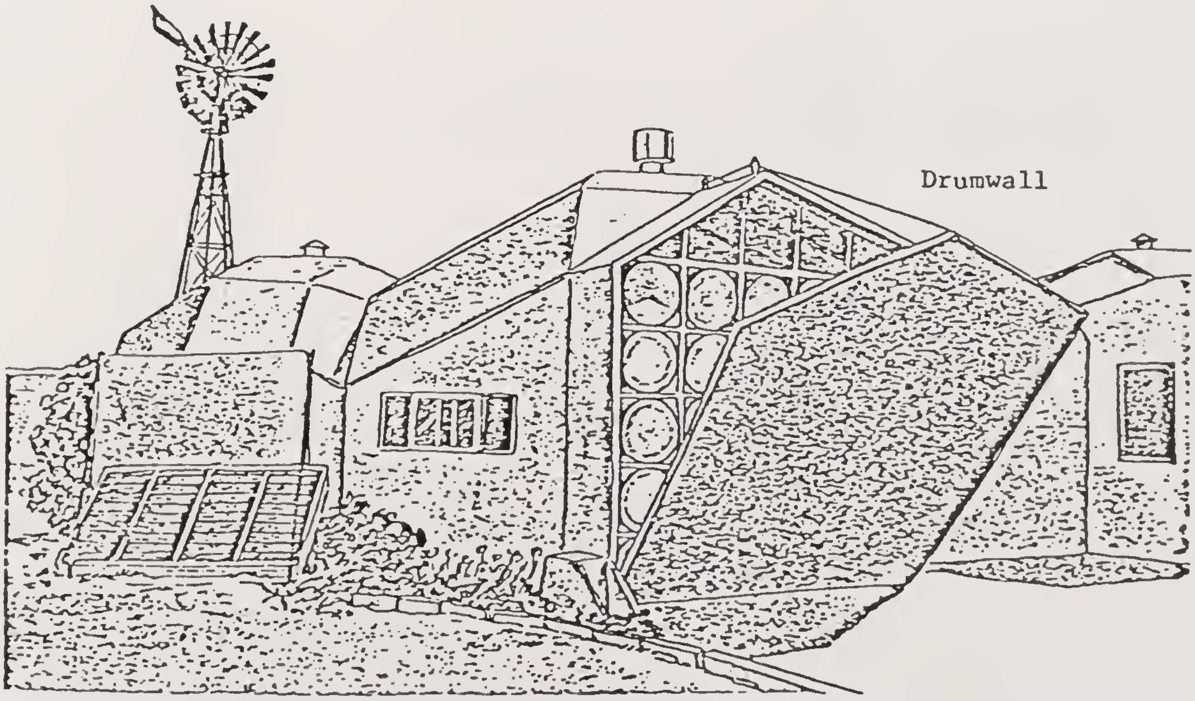
Reverse thermosiphoning cools the room.



Damper prevents reverse thermosiphoning.

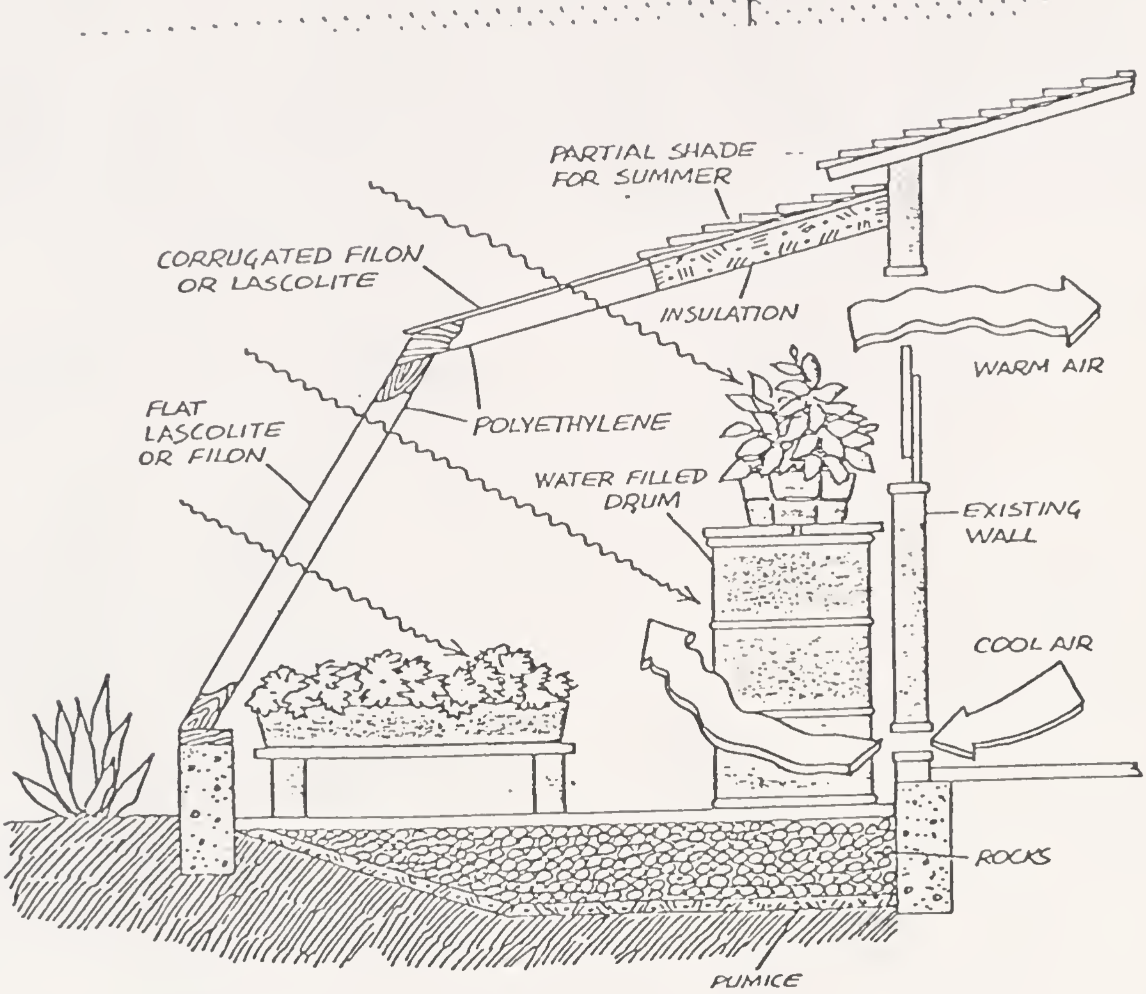


Chimney effect induces natural ventilation.

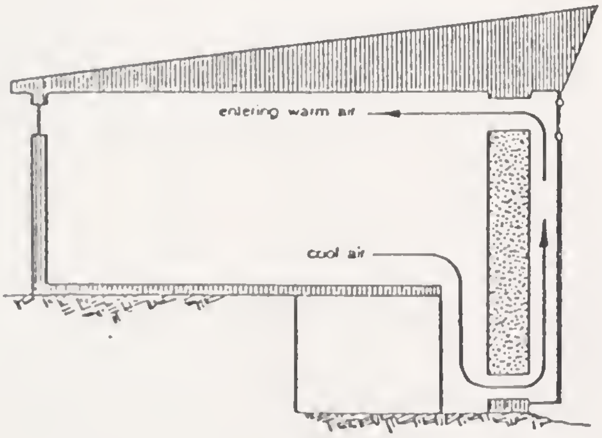


Southwest view of the Baer House in Corrales, New Mexico.

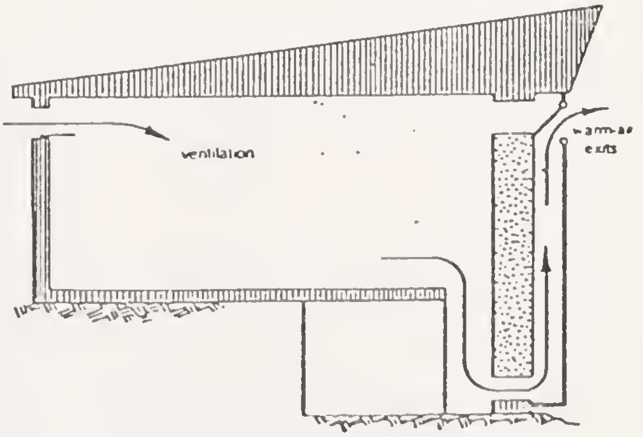
PASSIVE
or
DIRECT



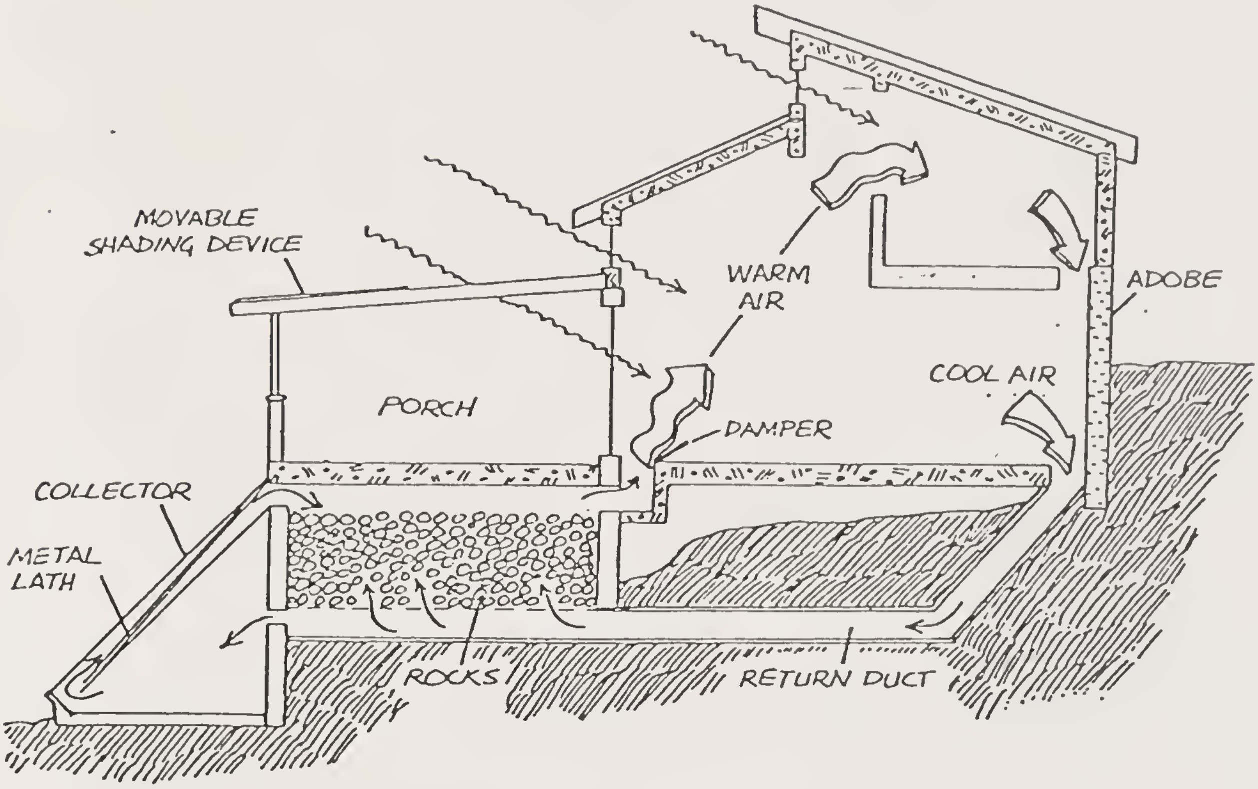
Cross section of Solar Sustenance Project greenhouse—daytime operation.



Trombe Wall: Winter



Trombe Wall: Summer



Solar heating system in the Davis House. There are two distinct flow loops—collector-to-storage and storage-to-house.

Diagrams and pictures used on these pages are taken from two excellent books on solar energy:

The Solar Home Book,
by Bruce Anderson.
$7.50 from Cheshire Books,
Harrisville, NH 03450

Other Homes and Garbage,
by Leckie, Masters, Whitehouse
and Young.
$9.95 from Sierra Club Books,
530 Bush St., San Francisco,
California 94108

ATTENDANCE

Name	Address	Business	Representing
1. Leonard Bronder	Denver, CO	Research	SPOW
2. Michael Elder	Helena	Savings & Loan	American Federal
3. John T. Keith	Kalispell	Banking	First Northwestern
4. Terry Savage	Lolo	Real Estate	Self
5. Bill Delp	Noxon	Hydro-Electric	IPD, Inc.
6. Michaela Syne	Bozeman	Appraiser	Self
7. M. L. Morton	Sante Fe, NM	Energy Resources	NM Energy Resources
8. Bill Low	Fort Harrison	Loan Guaranty	VA
9. Phylis Somers	Fort Harrison	Loan Guaranty	VA
10. Al Olson	Fort Harrison	Loan Guaranty	VA
11. Peter Sardagna	San Diego, CA	Savings & Loan	San Diego Federal
12. Randy Moy	Helena	Solar Coordinator	Montana Energy Offic
13. T. Joe Biehl	Helena	Banking	Home Federal Savings
14. Larry D. Geske	Great Falls		Great Falls Gas Co.
15. Don Inman	Helena		FHA
16. William C. Paullin	Kalispell	Banking	First Federal S & L
17. Gary Ryan	Kalispell		Jacobson & Ryan
18. Michael L. Schara		Carson Co., Inc.	Carson Co.
19. Ronald J. Iverson	Helena	Insurance	State Farm Ins.
20. Eileen Shore	Helena		EQC
21. Steve Perlmutter	Helena		EQC
22. Kye Cochran	Billings		AERO
23. Chester Kinsey	Helena	Contractor	Self
24. Jack B. Moore	Helena	Appraiser	Moore & Associates
25. A. Alan Kind	Helena	Appraiser	Moore & Associates
26. Wayne Neil	Bozeman		
27. Frank Smoyer	Helena	CPA	MERDI
28. Jim Thompson	Deer Lodge	Banking	Pioneer Fed. S & L
29. Robert Mastranrea	Great Falls	Banking	Federal S & L
30. Gary Wallace	Great Falls	Banking	Great Falls Fed. S&L
31. Jack Lovell	Missoula	Banking	Western Federal
32. Bob Quam	Helena	Realtor	Self
33. Donald L. Richard	Helena	News	Self
34. Bob White	Missoula	Appraiser	Self
35. Dana Gunderson	Helena	Engineer	DNR
36. Emil P. Eschenburg	Helena	Realtor	Self
37. Clarence H. Hewitt	Great Falls	Banking	First Federal S&L
38. Jan Konigsberg	Missoula		Montana Energy Offic
39. Jon A. Krutar	Helena	Economist	Self
40. Mike Fitzgerald	Helena	Commerce	Governor
41. Gary Kjensrud	Great Falls	Banking	Montana Bank
42. Douglas C. Allen	Great Falls	Banking	Northwestern Bank
43. Craig N. Hollen	Bozeman	Banking	Ist National Bank
44. James Whitehead	Helena		Lt. Gov.'s Office
45. Pietr G. Zwolle	Great Falls		Opportunities, Inc.
46. Jim Parker	Helena		
47. Dick Zier	Miles City	Banking	First National Bank
48. Dave Zieck	Billings	Banking	First Federal S&L
49. Jim Grunert	Billings	Banking	Second Fed. S&L
50. Jim Whitbeck	Billings	Banking	Midland Bank
51. Bill Stevens	Billings		Bill Stevens & Assoc

Name	Address	Business	Representing
52. R. W. Richardson	Billings	Banking	First Federal
53. Bob Kiesling	Helena		EIC
54. Richard H. Geissler		News	Lee Newspapers State Bureau
55. Bob Creek	Great Falls		Great Falls Gas
56. Sanna Porte	Helena		EIC
57. J. Lee Cook	Helena		Montana Energy Office

AGENDA FOR FINANCIAL WORKSHOP
Capitol Building, Room 413
November 15, 1977

Time	Item	Description
10:00 a.m. - 10:30 a.m.	Registration	Film: "Solar Energy Ready When You Are"
10:30 a.m. - 10:35 a.m.	Welcome	Lieutenant Governor, Ted Schwinden
10:35 a.m. - 10:40 a.m.	Workshop Moderator Quick Review of Workshop Schedule Introduction of First Speaker	Larry Geske, Executive Vice President, Great Falls Gas Co.
10:40 a.m. - 11:20 a.m.	Solar Equipment Technology Re: Financing Installations	Bruce Wilcox, Partner, Berkeley Solar Group, Berkeley, California
11:20 a.m. - 12:00 a.m.	A Banker's Approach to Solar Lending	Peter Sardagna, Assistant Vice-President, San Diego Federal Savings and Loan
12:00 p.m. - 1:00 p.m.	Lunch	No Host Luncheon, Village Inn Pancake House
12:30 p.m. - 1:20 p.m. (Presentation during lunch)	A Private Citizen's Problems in Financing the Solar Home of His Own Construction	Terry Savage, Lolo, Montana
1:00 p.m. - 1:20 p.m.	How a Solar Heating System Works - Components - Life - Savings	Kye Cochran, Founder & Director of AERO & Dana Gunderson, DNRC
1:20 p.m. - 1:40 p.m.	Problems Associated with Solar & Conservation Investment Appraising in Residential and Commercial Buildings	Jack Moore, Jack Moore & Associates, Helena, Montana
1:40 p.m. - 2:00 p.m.	Solar Installation Lending Concerns in Montana (Conventional, VA, FHA, Second Mortgage & Home Improvement Loans)	Michael Elder, Loan Officer, American Savings & Loan Association
2:00 p.m. - 3:30 p.m.	Work Groups (30 minutes each, break into groups of 1/3 of delegates in each work group, change groups every 30 minutes, discuss problems delegates are concerned with) Group 1 - Technology - Moderator - Kye Cochran Group 2 - Appraisal - Moderator - Jack Moore Group 3 - Lending - Moderator - Mike Elder	
3:30 p.m. - 4:00 p.m.	Closing Remarks by Guest Speakers Suggested solutions to questions that arose from each work group.	
4:00 p.m.	Adjourn	

QUESTIONNAIRE

TO: Financier — 188 of these questionnaires were sent out and 95 were returned. Below are the number of responses to each question.

Montana is presently developing a solar plan for the State as part of Western Regional Solar Planning Effort. One area of particular concern is the reluctance on the part of financial institutions to make loans for renewable alternative energy systems in homes. One of our purposes is to try and identify financial barriers that deters renewable energy development, and then to formulate programs to resolve these barriers. But before we can do so, we need to better understand the problems. The results of this questionnaire will be discussed during a workshop scheduled for the first week of November and attended by a small number of Montana financiers. Your immediate response to this questionnaire would be greatly appreciated.

1. How many loans have you made for renewable energy systems:

   a. solar energy systems 23 (see attached)
   b. wind energy systems none
   c. hydro energy systems none

2. How many loan applications for renewable energy systems have you disapproved:

   a. solar energy systems none
   b. wind energy systems none
   c. hydro energy systems none

3. Would you make loans for alternative energy systems if the following agencies guarantee the loans:

	Yes	No	Don't Know
a. Small Business Administration (SBA)	78 (82%)	4 (4%)	13 (14%)
b. Federal Housing Administration (FHA)	77 (81%)	3 (3%)	15 (16%)
c. Economic Development Administration (EDA)	49 (52%)	18 (19%)	28 (29%)
d. Veterans Administration (VA)	73 (77%)	8 (8%)	14 (15%)

4. Would your financial institution display renewable energy information to encourage home owners to install renewable systems:

Yes	No	If no, why?
92	3	

5. In reference to question 2, please note the primary deterrants that discourages financial institutions from lending to people who desire to build homes with renewable energies with or without conventional backup energy systems.
   High Front End Costs: 18; Reliability of the System: 9; Lack of Information: 10; Appraisal Problems: 10; Zoning Problems: 1.

Please return this questionnaire to: Montana Energy Office, c/o Lieutenant Governor's Office, Capitol Station, Helena, Montana, 59601

Name:____________________

Address:____________________ Zip:________

Phone:____________________

FINANCE QUESTIONNAIRES
RETURNS
As of 10/27/77

Loans made for renewable systems by banks: 23

Geographic Distribution:

Billings	
1st Citizen Bank	1
1st Federal Savings & Loan Association	3
Ist Northwestern National Bank	1
Security Federal Savings & Loan	2
Helena	
American Federal Savings & Loan	2
T. Joe Biehl	2
Great Falls	
Ist Westside National Bank	2
Bozeman	
Ist National Bank	3
Havre	
Havre Federal Savings & Loan	2
Missoula	
Ist Federal Savings & Loan	2
Kalispell	
Ist Federal Savings & Loan	1
Laurel	
Yellowstone Bank	1
Lewistown	
Northwestern Bank	1
	23

MONTANA ENERGY OFFICE
Capitol Station
Helena, Montana 59601

to: